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SELECTION AND INSTALLATION INSTRUCTIONS
high altitude gas pressure adjustment and pressure switch kit
for models HD/HDB, PDP/BDP, PTP, HDS/HDC, PTS/BTS, and PTC/BTC

⚠ WARNING

1. All field gas piping must be pressure/leak tested prior to operation. Never use an open flame. Use a soap solution or equivalent for testing.
2. Gas supply shall be shut-off and the electrical power disconnected before proceeding with the conversion. Failure to do so could result in fire, explosion, electrical shock, or the unit starting suddenly resulting in injury.

IMPORTANT

1. The use of this manual is specifically intended for a qualified installation and service agency. All installation and service of these kits must be performed by a qualified installation and service agency.
2. These instructions must also be used in conjunction with the Installation and Service Manual originally shipped with the appliance being converted, in addition to any other accompanying component supplier literature.

Modine's gas-fired equipment standard input ratings are certified by CSA or ETL. For elevations above 2,000 ft., ANSI Z223.1 requires ratings be reduced 4 percent for each 1000 ft. above sea level. For units in Canada, CSA requires that ratings be reduced 10 percent at elevations above 2,000 ft. The high altitude adjustment instructions and pressure switch kits appearing in this bulletin are for use with units that will be installed over 2,000 ft. These methods and kits comply with both ANSI Z223.1 and CSA requirements.

If a unit is to be installed at higher elevations AND converted from natural gas to propane gas operation, a propane conversion kit must be used in conjunction with the pressure adjustment methods and pressure switch kits listed herein. For the Selection and Installation Instructions for propane conversion kits for units with **tubular** heat exchangers (HD, HDB, HDS, HDC, PTP, PTS, BTS, PTC, or BTC), please see the latest revision of Modine Bulletin 75-515. For the Selection and Installation Instructions for propane conversion kits for units with **clamshell** heat exchangers (PDP or BDP), please see the latest revision of Modine Bulletin 75-511.

Selection of the Proper Pressure and Kit

To determine the proper manifold pressure at altitude and if required, the proper combustion air pressure switch kit, the full model number of the heater, the fuel to be used, and the altitude the unit will be installed at must be known. Refer to the unit serial plate or carton label to obtain the necessary information about the unit.

After obtaining this information, refer to the proper gas pressure and selection charts. The pressure charts are differentiated by elevation, fuel type, and country the product is being installed in. The selection charts are differentiated by product type, altitude and fuel type. **If converting from natural gas to propane gas and operation at high altitude, both a propane conversion kit and a pressure switch kit must be used (if applicable).** Selection charts include the proper kit suffix, when required.

Manifold Pressure Adjustment

The inlet pressure to the unit must be confirmed to be within acceptable limits (6-7" W.C. for natural gas and 11-14" W.C. for propane gas) before opening the shutoff valve or the combination gas valve may be damaged.

Heaters for use with **natural gas** have gas valves factory set at 3.5" W.C. manifold pressure at 7.0" W.C. inlet pressure.

Units for use with **propane gas** are set for 10.0" W.C. manifold pressure at 14.0" W.C. inlet pressure.

Installation above 2,000 ft. elevation requires adjustment of the manifold pressure as detailed in the following pages.

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PLEASE BE SURE TO LEAVE IT WITH THE OWNER WHEN YOU LEAVE THE JOB.

Derated BTU Content Gas and Manifold Pressure Calculation

Some utility companies may derate the BTU content (heating value) of the gas provided at altitude to a value other than 1,050 BTU/ft^3 for Natural Gas or 2,500 BTU/ft^3 for Propane Gas to allow certain heating appliances to be used with no manifold pressure adjustments. For this reason it is necessary that the supplying utility be contacted for detailed information about the gas type and BTU content (heating value) before operating any heater. Tables 2.1 and 2.2 show the standard derated heating values (4% per 1,000' of elevation in the USA and 10% between 2,001' and 4,500' elevation in Canada) of natural and propane gases at various altitudes. If the utility is supplying gas with heating values as shown in Tables 2.1 and 2.2, the manifold pressure should be set to 3.5 in. W.C for natural gas and 10.0 in. W.C. for propane gas.

Table 2.1 – Natural Gas Heating Values at Altitude①③④

Altitude (ft)	Gas Heating Values at Altitude (BTU/ft^3)	
	USA	CANADA
0-2,000	1,050	1,050
2,001-3,000	929	945
3,001-4,000	892	
4,001-4,500	874	
4,501-5,000	856	856
5,001-6,000	822	822
6,001-7,000	789	789
7,001-8,000	757	757
8,001-9,000	727	727
9,001-10,000	698	698

Table 2.2 – Propane Gas Heating Values at Altitude②③④

Altitude (ft)	Gas Heating Values at Altitude (BTU/ft^3)	
	USA	CANADA
0-2,000	2,500	2,500
2,001-3,000	2,212	2,250
3,001-4,000	2,123	
4,001-4,500	2,080	
4,501-5,000	2,038	2,038
5,001-6,000	1,957	1,957
6,001-7,000	1,879	1,879
7,001-8,000	1,803	1,803
8,001-9,000	1,731	1,731
9,001-10,000	1,662	1,662

① Values shown are for 3.5 in. W.C. manifold pressure , for other BTU content values (available from local utility) use Equation 2.1 to calculate manifold pressure.
② Values shown are for 10.0 in. W.C. manifold pressure , for other BTU content values (available from local utility) use Equation 2.1 to calculate manifold pressure.
③ When installed at altitudes above 2,000', a pressure switch may need to be changed. Refer to Tables 3.1 through 4.2 to determine if a switch change is required.
④ Gas Heating Values are derated 4% per 1,000' of elevation in the USA and 10% between 2,000' and 4,500' elevation in Canada in accordance with ANSI Z223.1 and CSA-B149, respectively.

If the heating value of the gas being supplied is different than the values shown in Tables 2.1 and 2.2, use the following equation to determine the appropriate manifold pressure for the altitude and gas heating value being supplied.

Equation 2.1 – Manifold Pressure for Derated Gas

$$MP_{ALT} = \left(\frac{BTU_{TBL}}{BTU_{ACT}}\right)^2 \times MP_{SL}$$

Where: MP_{ACT} = Manifold Pressure (in. W.C.) at Altitude – Manifold pressure setting for the heater being installed
BTU_{TBL} = BTU/ft^3 content of gas - obtained from Tables 2.1 or 2.2 (whichever is applicable)
BTU_{ACT} = BTU/ft^3 content of gas - obtained from the utility company
MP_{SL} = Manifold Pressure (in. W.C.), at Sea Level – use 3.5" W.C. for Natural Gas and 10.0" W.C. for Propane

NOTE: Only the primary Manifold Pressure should be adjusted on units equipped with two-stage or modulating gas controls. No adjustments to the Low Fire Manifold Pressure are necessary on these units.

High Altitude Pressure Switch Kit Selection

In some instances, the combustion air proving (pressure) switch may need to be changed depending upon the unit style, model size, and installation altitude. The example selection procedure shown on the following page, along with the associated tables, will guide the installer as to when a High Altitude Pressure Switch is required and which switch is to be used.

High Altitude Pressure Switch Kit Selection Guide

Example: select the appropriate kit for an HD 125AS0111 for installation at 6,000' elevation. Referring to Tables 3.1 through 3.5, it can be identified that Table 3.1 should be used as it applies to HD units.

In the column for 5,501-6,500 feet elevation, it can be seen that the kit suffix is -4. All conversion kits have the same base number (**3H037813**), only the suffix of the part number changes by model size. All kits are appropriate for use with both natural and propane gas. The full kit number is 3H037813-4 and the item code is 68408.

Table 3.1 – High Altitude Switch Kits for HD/HDB Models

Model Size	Kit Details	U.S.A and Canada						
		2,001-4,500 ft	4,501-5,500 ft	5,501-6,500 ft	6,501-7,500 ft	7,501-8,500 ft	8,501 - 9,500 ft	9,501-10,000 ft
30-60	Kit Suffix	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
	Item Code							
75	Kit Suffix	Not Required	Not Required	Not Required	Not Required	0001	0001	0001
	Item Code					68405	68405	68405
100	Kit Suffix	Not Required	Not Required	Not Required	0004	0004	0004	0004
	Item Code				68408	68408	68408	68408
125	Kit Suffix	Not Required	Not Required	0004	0004	0004	0004	0004
	Item Code			68408	68408	68408	68408	68408

Table 3.2 – High Altitude Switch Kits for HDS/HDC Models

Model Size	Kit Details	U.S.A and Canada							
		2,001-2,500 ft	2,501-4,500 ft	4,501-5,500 ft	5,501-6,500 ft	6,501-7,500 ft	7,501-8,500 ft	8,501 - 9,500 ft	9,501-10,000 ft
30	Kit Suffix	Not Required	Not Required	-3	-5	-5	-10	-10	-10
	Item Code			68407	68409	68409	68414	68414	68414
45	Kit Suffix	Not Required	-2	-4	-3	-6	-10	-10	-11
	Item Code		68406	68408	68407	68410	68414	68414	68415
60	Kit Suffix	Not Required	-3	-3	-5	-7	-11	-11	-11
	Item Code		68407	68407	68409	68411	68415	68415	68415
75	Kit Suffix	Not Required	-3	-3	-5	-7	-11	-11	-11
	Item Code		68407	68407	68409	68411	68415	68415	68415
100	Kit Suffix	Not Required	Not Required	Not Required	Not Required	-4	-4	-4	-4
	Item Code					68408	68408	68408	68408
125	Kit Suffix	Not Required	Not Required	Not Required	-4	-4	-4	-4	-4
	Item Code				68408	68408	68408	68408	68408

Table 3.3 – High Altitude Switch Kits for PDP/BDP Models

Model Size	Kit Details	U.S.A. and Canada			
		2,001-4,500 ft	4,501-5,500 ft	5,501-6,500 ft	6,501-7,500 ft
150-400	Kit Suffix	Not Required	Not Required	Not Required	Not Required
	Item Code				

Table 3.4 – High Altitude Switch Kits for PTP/PTS/BTS Models

Model Size	Kit Details	U.S.A. and Canada			
		2,001-4,500 ft	4,501-5,500 ft	5,501-6,500 ft	6,501-7,500 ft
150-300	Kit Suffix				
	Item Code	Not Required	Not Required	Not Required	Not Required
350	Kit Suffix			-8	-8
	Item Code	Not Required	Not Required	68412	68412
400	Kit Suffix	-9	-9	-9	-9
	Item Code	68413	68413	68413	68413

Table 3.5 – High Altitude Switch Kits for PTC/BTC Models

Model Size	Kit Details	U.S.A. and Canada			
		2,001-4,500 ft	4,501-5,500 ft	5,501-6,500 ft	6,501-7,500 ft
55-310	Kit Suffix	Not Required	Not Required	Not Required	Not Required
	Item Code				

Installation

1. Read these instructions carefully. Failure to follow instructions can damage product or cause a hazardous condition.

2. Adjustment of the manifold pressure and installation of the pressure switch (if applicable) must be performed by a qualified service person. The qualified service agency performing this work assumes responsibility for the proper conversion and adjustment of this appliance.

3. This procedure requires the following:
    - A conversion rating plate (5H0807146005)
    - A pressure switch (see Tables 3.1 – 3.5)

4. On the High Altitude Conversion Label included with these instructions, write the new manifold pressure at both high and low fire, elevation of installation, derated input, and derated output at high fire in permanent marker.

5. Remove the access panel to the heater.

6. For units requiring a pressure switch change (refer to Tables 3.1 through 3.5), disconnect wires and remove screws. Install new switch and attach wires. Note: wires are interchangeable.

7. Affix the High Altitude Conversion Label that came with the unit or kit on the heater near the serial plate on the same panel as the common replacement parts label.

Check

1. See the original rating plate for the unit heater's rated input and verify by checking the correct main burner orifice size and manifold pressure. This information is presented in the unit Installation & Service (I&S) manual.

2. Remove the inlet and outlet pressure tap plugs and place pressure taps on both the inlet and outlet pressure tap of the gas valve.

3. Connect a pressure-measuring device capable of reading inches of water column onto the inlet and outlet pressure taps.

4. Follow lighting instructions on the unit. Turn up thermostat setting to call for high stage heating. After the main burners light, measure the outlet (manifold) pressure of the combination gas valve. The pressure should be as determined in Tables 2.1 and 2.2 or as calculated with Equation 2.1, whichever is applicable. The outlet pressure can be adjusted at the valve's regulator. Turning the adjustment clockwise will increase the outlet pressure, while turning it counterclockwise will decrease the pressure.

5. Repeat the process for low stage heating by turning the thermostat setting down to call for low stage heating. Verify the manifold pressure setting is correct per the I&S manual that came with the unit. Adjust as necessary using the instructions in the I&S manual.

6. There are no adjustments that can be made to the burner flame on units with tubular heat exchangers. Units with clamshell heat exchangers may have air shutters for flame adjustment. If the flame is lifting or rising above the burner port, loosen the thumb screw on the air shutter and slide it forward toward the mixer tube. If the majority of the flame is yellow, move the air shutter back away from the mixer tube. Some yellow in the flame is acceptable on propane flames as long as no carbon (black soot) is being formed.

   For more specific flame control adjustment instructions, see the I&S manual that came with the unit.

7. Turn the heater off and replace the inlet and outlet pressure tap plugs.

8. Place the heater back into service and leak test the inlet and outlet pressure tap plugs, as well as the connection between the gas valve and the manifold piping and supply piping to the gas valve.

Modine Manufacturing Company has a continuous product improvement program, and therefore reserves the right to change design and specifications without notice.

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